

## HAZARD CONTROL PLAN Renewal Cover Sheet

## LANSCE Division

<b>Title of Hazard Control Plan:</b> Use of Special $^{252}\text{Cf}$ Sources			
<b>Hazard Control Plan Identification Number:</b> LANSCE-3 HCP-12			
<b>Brief Description of Work:</b> This HCP covers the use and storage of the LANSCE-3/WNR special thinly encapsulated, strongly-bonded $^{252}\text{Cf}$ sources. The $^{252}\text{Cf}$ sources are used as sources of fission fragments, gamma rays and neutrons in research. At present three sources are available and covered by this HCP, but the addition of other similar sources is planned. Additional sources of the same general type may be added to this HCP by adding attachments describing the new sources.			
<b>Reviewer of the Plan</b> (This HCP and the operating experience have been reviewed and no significant modifications are needed at this time):			
Ronald O. Nelson	Staff Member	<i>Ronald O. Nelson</i>	11/5/02
Name	Title	Signature	Date
<b>Initial Risk Estimate:</b> <input type="checkbox"/> Minimal <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High			
<b>Applicable Safety Permits Required to Perform Work:</b> None			
<b>Residual Risk Estimate:</b> <input type="checkbox"/> Minimal <input checked="" type="checkbox"/> Low <input type="checkbox"/> Moderate			
<b>Work Authorization:</b>			
BRUCE TAKALA	LANSCE-3 DGL	<i>Bruce Takala</i>	11-5-02
Name	Title	Signature	Date
<b>Next Authorization Review Date:</b> 10/30/2003			

HAZARD CONTROL PLAN Renewal Cover Sheet

LANSCE Division

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<b>Hazard Control Plan Identification Number:</b> LANSCE-3 HCP-12			
<b>Brief Description of Work:</b> This HCP covers the use and storage of the LANSCE-3/WNR special thinly encapsulated, strongly-bonded <sup>252</sup> Cf sources. The <sup>252</sup> Cf sources are used as sources of fission fragments, gamma rays and neutrons in research. At present three sources are available and covered by this HCP, but the addition of other similar sources is planned. Additional sources of the same general type may be added to this HCP by adding attachments describing the new sources.			
<b>Reviewer of the Plan</b> (This HCP and the operating experience have been reviewed and no significant modifications are needed at this time):			
<u>Ronald O Nelson</u>	<u>Staff Member</u>	<u>Ronald O. Nelson</u>	<u>1/29/02</u>
Name	Title	Signature	Date
<b>Initial Risk Estimate:</b> <input type="checkbox"/> Minimal <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High			
<b>Applicable Safety Permits Required to Perform Work:</b> None			
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<b>Work Authorization:</b>			
<u>BRUCE TAKALA</u>	<u>DGL</u>	<u>Bruce Takala</u>	<u>1-30-02</u>
Name	Title	Signature	Date
<b>Next Authorization Review Date:</b> <u>1/28/03</u>			

**LANSCCE Division**  
**Hazard Control Plan Cover Sheet**

Use of Special <sup>252</sup> Cf Sources		
LANSCCE-3 HCP-12	Revision: 0	Date:4/2/99
Location of Work: TA-53/ WNR		Group: LANSCE-3
<b>Authors:</b>	<b>Signature</b>	<b>Date</b>
Ron O Nelson		4/2/99

<b>Initial Risk Level: medium</b>		
<b>REVIEW/APPROVAL</b>		
<b>Reviewed by:</b>		
Bruce Takala (LANSCCE-3)		
Terry Taddeucci (L-3)		
Don Mikkelson (ESH-1)		

<b>Residual Risk Level: low</b>		
<b>Approved by:</b>		
<b>Next Authorization Review Date: 1/28/03</b>		

## Use of Special <sup>252</sup>Cf Sources

**Work definition:** This HCP covers the use and storage of the LANSCE-3/WNR special thinly encapsulated, strongly-bonded <sup>252</sup>Cf sources. The <sup>252</sup>Cf sources are used as sources of fission fragments, gamma rays and neutrons in research. At present three sources are available and covered by this HCP, but the addition of other similar sources is planned. Additional sources of the same general type may be added to this HCP by adding attachments describing the new sources.

**Potential hazards:** The main hazard of these sources is the ionizing radiation they emit. If the source develops a leak, the elemental Cf also poses a material hazard. The initial risk posed by the quantities of <sup>252</sup>Cf in these sources as a radiological poison is estimated as “**medium**”.

**Operational requirements:** **LIR402-716-01.0** (*Radioactive Source Control*) and **WNR-ROP-13** (*Site Specific Policies for Radioactive Source Control at WNR*) describe procedures for storing, handling and using radioactive sources.

### Controls:

Engineering controls: The encapsulations of these sources, designed to prevent the release and spread of the <sup>252</sup>Cf material, are the primary controls that reduce the hazard of working with them.

Posting requirement: When in use, a sign must be posted indicating the type of source in use and the dose rate. This sign must be kept with the source.

Handling method: As a precaution, gloves must be worn when handling these sources. The sources should be handled by the outside edges of encapsulation. Preferably the sources will be mounted in dedicated holders by which they can be handled. If possible, handle these sources with tongs or other devices to minimize exposure. The use of self-monitoring with an alpha-particle detector (available from ESH-1) during use is recommended.

Procedure for use: The source will normally be stored in the radioactive materials safe in MPF-7. An authorized user may obtain the combination to the safe from the LANSCE-3 Source Custodian or the LANSCE-3 Nuclear Materials Custodian. Users must fill out the entries in the Source Control Log Book kept with the source before removing the source from the cabinet. The can in which the source is stored may be used to hand carry the source from this cabinet to its intended place of use. When the source is located in its intended place of use, a “*Caution Radioactive Material, Source in Use*” sign must be posted, indicating the type of source, the dose rate, and other specifics which may be appropriate. Once the source is no longer needed, it must be returned to the can. The source must then be returned to the safe and the pertinent entries in the Source Control Log Book must be filled out.

### Specific Dos and Don'ts

- **Do** follow the guidelines in **LIR402-716-01.0** (*Radioactive Source Control*) and **WNR-ROP-13** (*Site Specific Policies for Radioactive Source Control at WNR*) for handling radioactive sources. Some of these guidelines are repeated below.
- **Do not** place the source in any primary or secondary LANSCE beam.
- **Do** notify the Source Custodian immediately if the source is damaged or if you have any other reason to suspect the integrity of the source encapsulation is in question. If the source custodian is not available, contact ESH-1 at 7-7069.
- **Do** stay as far from the source as possible to minimize your radiation dose.
- **Do not** remove source from LANSCE-3 controlled areas without notifying the LANSCE-3 Source Custodian and following proper transportation procedures.
- **Do not** loan the source to unauthorized users.

Storage: When not in use, the sources are stored in a sealed can and shielded if necessary to reduce exposure levels.

**Survey Requirements:** For these registerable, thinly-bonded sources, semi-annual monitoring of the source for leakage is required (**LIR402-716-01.0** (*Radioactive Source Control*)). Alpha monitoring of the source before and after use is recommended. Alpha monitoring is required if a source is suspected of leaking due to damage. **Leak test method:** Direct Nucon Smear. **Type of Instrument to Be Used in the Leak Test:** Ludlum Model 139 or equivalent.

**Dosimetry Requirements:** All authorized users must wear a TLD badge when using these sources.

**Protective clothing requirements:** Gloves.

#### **Required Knowledge Skills & Abilities:**

Users of these sources must read and follow this HCP and **WNR-ROP-13** (*Site Specific Policies for Radioactive Source Control at WNR*) or the equivalent updated document, and have Radworker 2 training.

**Wastes:** No waste is generated through the use of the sources. If the sources are no longer needed transfer or disposal must be arranged according to laboratory procedures.

**Residual Risk:** The residual risk of using these sources with implementation of the above engineering and administrative controls is estimated as “**low**”.

**Emergency Procedures:** If any event occurs which might compromise the integrity of the encapsulation the personnel present should immediately go to the nearest telephone and call ESH-1 (667-7069), report a suspected leak of a Cf source and request monitoring. After calling, the personnel must remain at the phone to prevent spread of possible contamination. If the outcome of the monitoring shows leakage, personnel must follow the directions of the RCT.

**Change Control Process:** This document must be reviewed at least annually. The latest version will be available on the LANSCE-3 web site, in the LANSCE-3 group office, and a copy will be kept with the sources.

**Physical Description of Source:** The  $^{252}\text{Cf}$  source is in the form of a solid metal electroplated deposit on a thin foil (typically Be, Al, or Ni). Two sources were fabricated at LLNL (Mark Stoyer). For these two sources the deposit is glued to a larger backing, usually of similar composition to the deposit foil. The backing and deposit foils are glued, typically using cyanoacrylate (CA), so as to sandwich the  $^{252}\text{Cf}$  between the two foils. For some samples a thin layer of CA may be smeared on the smaller electroplated foil to bond any contamination. The samples are then sealed in self adhesive plastic laminate (Avery LS-2P or similar, each sheet ~0.09 mm thick) to completely contain the Cf. These two sources release no fission products and only the most energetic alpha particles penetrate the plastic covering. One source (Model FF-363, 10  $\mu\text{Ci}$ ) is from Isotopes Products Inc. (ramlauer@isotopeproducts.com). This consists of a Cf deposit electroplated onto a .001 mm thick Ni backing. The backing and a similar foil are bonded to .010 inch thick stainless steel rings which are welded to seal in the Cf. This source emits alpha particles and fission products, but should not exhibit surface contamination unless damaged or leaking. When not in use, the sources are stored in a sealed can and shielded if necessary to reduce exposure levels. The source control numbers and their activities are listed in the attachments.

**Properties of  $^{252}\text{Cf}$ :**  $^{252}\text{Cf}$  is an alpha emitter (97%) as well as undergoing spontaneous fission (3%). There are gamma-rays associated with both decay modes, and neutrons produced by spontaneous fission. The half-life of  $^{252}\text{Cf}$  is 2.645 years.

## Attachment

**Radionuclide:**  $^{252}\text{Cf}$  ( $t_{1/2} = 2.645 \text{ y}$ )

**Source control number:** 0500

**Activity/Date:**  $2. \mu\text{Ci}$ ,  $6 \times 10^3$  neutrons/s (10/97),  $8.9 \times 10^4$  alphas/s (10/97)

Dose rate	At 1 Foot	Contact
neutron	0.5 mr/hr	1.5 mr/hr
gamma	0.4 mr/hr	12. mr/hr

**Description:** Al backed

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**Source control number:** 0499

**Activity/Date:**  $3. \mu\text{Ci}$ ,  $8 \times 10^3$  neutrons/s (10/97),  $11.9 \times 10^4$  alphas/s (10/97)

Dose rate	At 1 Foot	Contact
neutron	0.5 mr/hr	1.5 mr/hr
gamma	0.5 mr/hr	18. mr/hr

**Description:** Be backed

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**Source control number:** 00542

**Activity/Date:**  $10 \mu\text{Ci}$ ,  $2.5 \times 10^4$  neutrons/s (2/99),  $37.2 \times 10^4$  alphas/s (2/99)

Dose rate	At 1 Foot	Contact
neutron	<0.5 mr/hr	1.5 mr/hr
gamma	1.8 mr/hr	12.0 mr/hr

**Description:** Isotope Products Laboratories Model FF362, Ni backed

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**Source control number:** \_\_\_\_\_

**Activity/Date:** \_\_\_\_\_  $\times 10$  neutrons/s (\_\_\_\_/97)

Dose rate	At 1 Foot	Contact
neutron	_____ mr/hr	_____ mr/hr
gamma	_____ mr/hr	_____ mr/hr

**Description:**

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## Authorized Source Handlers

List approved by \_\_\_\_\_ Date \_\_\_\_\_  
 LANSCE-3 Designated Staff Member

**Change control:**

**3/6/01 – Changed required training from Radworker I or II to Radworker II only. - RN**